

NOTES ON AMERICAN WILLOWS. III

A CONSPECTUS OF AMERICAN SPECIES AND VARIETIES OF SECTIONS RETICULATAE, HERBACEAE, OVALIFOLIAE, AND GLAUCAE

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In this third article, as I said in my first paper,¹ a key will be given containing the species treated in the first two papers, and also those of the sections RETICULATAE and HERBACEAE (RETUSAE), together with a few other species the systematic position of which is not yet fully understood, but which are best placed near one of these groups. I have tried to prepare two separate keys for the determination of the male and female plants as I did in "Conspectus analyticus Salicum Asiae orientalis Himalayaeque" in SARGENT, Pl. Wils. 3:73. 1916. Typical complete specimens are not always at hand, and without them even such a good key as that given by COVILLE (in Proc. Wash. Acad. Sci. 3:300. 1901) to the Alaskan willows is insufficient to determine species. To make a key to the sections only proves likewise of little value owing to the great difficulty of exact limitation of the groups, as I shall explain later.

Clavis specierum

I. SECUNDUM SPECIMINA FEMINEA

A. Ovaria (pedicellis inclusis) etiam juvenilia glaberrima.

I. Folia utrinque concoloria, viridia et stomatifera, minima vel parva; amenta serotina, vulgo pauciflora; bractae pl.m. concolores, flavescentes vel violascentes, vix vel sparse brevipilosae; fruticuli minimi prostrati (sed vide 7. *S. Peasei*).

Folia semper crenato-dentata, utrinque tenuiter reticulata, anni praeteriti nunquam persistentia.

Ramuli floriferi tenuissimi, breves, fere semper bifoliati; bractae flavescentes, sparse pilosae. 8. *S. herbacea*

Ramuli floriferi crassiores, longiores, 2-4-foliati; bractae fusciscentes, albido-pilosae. 7. *S. Peasei*

¹ BOT. GAZ. 66:118. 1918.

Folia integerrima, adulta sicca per secundum annum vel diutius persistentia.

Nervi laterales foliorum utrinque pl.m. elevati, venulae etiam prominulae (confer etiam 10. *S. phlebophyllam*, cujus fructus interdum glaberrimi sunt) . . 9. *S. rotundifolia*
Nervi laterales foliorum superne tenuissime incisi, subtus prominentes, venulae haud visibiles. . 11. *S. Dodgeana*

II. Folia discoloria, subtus distincte pallidiora, pl.m. glaucescentia (saepissime pruinosa); fruticuli repentes vel parvi, erecti.

Bracteaе concolores, flavescentes, glabrae vel sparse tantum ciliatae.

Fruticuli parvi, erecti, ramis non prostratis et radicanibus; styli distincti, quam stigmata brevia bifida longiores, haud vel tantum apice fissi; folia circiter 3-5plo longiora quam lata.

Folia superne cito margine excepto glabra, stomatifera
21. *S. chlorolepis*

Folia superne infimis exceptis pl.m. villosula, estomatifera 22b. *S. brachycarpa* var. *glabellarpa*
Fruticulus depressus, ramis prostratis radicanibus; stylus brevissimus, vulgo bifidus stigmatibus bifidis haud longior; folia satis crassa, vix 1½plo longiora quam lata

3. *S. leiolepis*

Bracteaе pl.m. bicolores, ad apicem vel fere totae fuscae, pl.m. longe sericeo-pilosae; fruticuli parvi, prostrati, ramis radicanibus.

Ovaria etiam juvenilia distincte pedicellata; pedicellus fructuum glandulam late ellipsoideo-rectangularem vel subquadratam circ. 2plo superans; stylus distinctus, apice bifidus stigmatibus brevibus oblongis bifidis subduplo longior; folia superne haud stomatifera, margine vulgo sparse et saepe indistincte denticulata

18. *S. arctophila* f. *lejocarpa*

Ovaria subsessilia vel breviter pedicellata, pedicello etiam fructuum quam glandula pl.m. breviora vel vix sublongiora.

Folia pl.m. glanduloso-crenato-denticulata (saltem ad medium et apicem), rarius subintegerrima, superne sto-

matifera, adulta marcescentia partim diu persistentia; stipulae saepe distinctae; stylus apice bifidus stigmatibus brevissimis bifidis 2-2½plo longior. . . . 6. *S. Uva-ursi*
Folia integerrima, rarissime basim versus paucidentata; stipulae nunquam distinctae.

Amenta cylindrica, 3-4plo longiora quam lata, 3-5 cm. longa (saltem basi) sublaxiflora; folia majora ultra 3 cm. longa, superne non stomatifera

15. *S. arctica* f. *glabrata*

Amenta etiam fructifera vix ad ½plo longiora quam lata, densiflora; folia etiam maxima vix ultra 2.5 cm. longa vel superne stomatifera.

Stylus satis brevis, stigmatibus mediocribus vix longior; fructus maturi vulgo pl.m. glaucescentes; folia superne (in var. *camdensi* excepta) haud stomatifera, matura subcrassa, subtus conspicue elevato-reticulata. 16. *S. ovalifolia*

Stylus elongatus tenuis, stigmatibus angustis longis saepe pl.m. longior; fructus maturi vix glaucescentes; folia superne stomatifera, matura tenuiora, subtus vix conspicue reticulata. . . . 17. *S. stolonifera*

B. Ovaria (interdum tantum partim vel nonnisi pedicelli) pl.m. dense pilosa; fructus saepe glabriores vel partim glabri.

I. Folia (sub anthesi perfecte evoluta) utrinque concoloria, viridia, aequaliter stomatifera, integerrima; fruticuli minimi repentes.

Ramuli floriferi breves, tenuissimi, vulgo 2-foliati; folia utrinque tenuiter reticulata, adulta sicca non persistentia; amenta pauciflora, vel multiflora; ovaria interdum tantum ad apicem pilosa, pl.m. sessilia; stylus distinctus, stigmatibus vulgo longior; glandula 1. 5. *S. polaris*

Ramuli floriferi 2-4-foliati; folia adulta marcescentia parenchymate evanescente plures annos persistentia; amenta pluriflora, cylindrica; ovaria saepius distinctius pedicellata; glandula etiam dorsalis interdum adest (confer etiam 9. *S. rotundifoliam* f. *pilosiusculam*). 10. *S. phlebophylla*

II. Folia subtus discoloria, pallidiora vel pl.m. glaucescentia, vulgo pruinosa, vel plantae aliis signis diversae.

a. Folia circumcirca satis dense minute glanduloso-serrata, obovata, fere glabra; stipulae distinctae, lanceolatae, serratae; amenta pedunculo excluso 5-6 cm. longa, 10-15 mm. crassa; stylus distinctus, stigmatibus circ. 2plo longior; planta prostrata 29. *S. Chamissonis*

b. Folia integerrima vel pl.m. crenato-denticulata, vel plantae aliis signis diversae.

1. Amenta serotina, pseudoterminalia, anguste cylindrica vel minima pauciflora, pedunculis nudis iis saepe aequi-longis suffulta; bracteae breviter (rarius longius) pilosae, pl.m. concolores, flavescentes vel violascentes; ovaria sessilia vel subsessilia; styli (*S. venusta* excepta) brevissimi vel nulli, stigmata brevia vel brevissima; glandulae 2 vel interdum plures pseudodiscum lobulatum formantes; folia satis crassa, superne pl.m. inciso-reticulata, rugosa, haud stomatifera (*S. venustae?*), subtus distincte elevato-reticulata, vulgo pl.m. longe petiolata.

Folia coriacea, pleraque vix longiora quam lata vel ultra 4 cm. longa, superne conspicue inciso-reticulata, rugulosa; bracteae intus pl.m. brevipilosae vel utrinque sericeae.

Frutex prostratus; folia cito glaberrima vel rarius pilis paucis sericeis obsita, vix ad 5.5:5 cm. magna; petioli elongati, ad 3 cm. longi; bracteae intus tantum brevipilosae; fructus vix ultra 4.5 mm. longi

1. *S. reticulata*

Frutex prostratus vel erectus; folia etiam adulta subtus dense sericea vel majora, oblongiora et margine pl.m. distincte crenulata, vel petioli breves gemmis vix longiores; bracteae utrinque pl.m. sericeo-pilosae; fructus 5-7 mm. longi 2. *S. vestita*

Folia tenuiora (chartacea), minima vel distincte longiora quam lata, vix ultra 3.5:2 cm. magna, superne vix vel indistincte inciso-reticulata; bracteae glabrae vel tantum margine basique pilosae, rarius etiam extus pl.m.

pilosulae; frutices prostrati, interdum minimi suffruticulosi (confer etiam 31. *S. venustam* cujus specimina nondum vidi et quae stylo elongato filiformi fusco distincta dicitur; tantum a Sitka reportata)

4. *S. nivalis* et var. *saximontana*

2. Amenta coetanea, rarius pl.m. serotina, lateralia, ovata vel cylindrica, multiflora, rarius parva et pauciflora, sed pedunculi semper foliati; folia pl.m. tenuiter papyracea, superne nunquam inciso-reticulata.

a) Bractee bicolores, apice vel pro parte maxima fuscae, versus apicem longe sericeae (id est pilis longis sericeis quam bractea vix vel paullo brevioribus instructae), interdum apice tantum ciliatae; fruticuli fruticesque parvi ramis ut videtur semper prostratis (confer etiam 28. *S. lingulatam* speciem valde incertam).

Stylus sub nullus, quam stigmata divaricata bifida duplo brevior; amenta parva circ. 10 mm. longa, ovoidea vel ovato-globosa; bractee atrae, extus sparse sericeae vel partim glabrae; ovaria breviter pedicellata, albo-sericeo-villosula; folia ovata vel late lanceolata, obtusa, rigida vix ad 12 mm. longa. . . . 30. *S. glacialis*
Stylus semper distinctus, stigmatibus aequilongus vel vulgo longior.

Folia sicca anni praeteriti pl.m. persistentia, linguata, lineari- vel anguste oblanceolata (vel lanceolata apice subplicato-acuminata), vix ultra 18:5 mm. magna, superne stomatifera, subtus paullo pallidiora; amenta parva, etiam fructifera vix ad 2.5:0.9 cm. magna pedunculis 0.5-3 cm. longis exclusis; bractee laxae sericeae, extus saepe glabrescentes; (ovaria et) fructus sessiles, circ. 4-5.5 mm. longi, pl.m. villosotomentosi. 12. *S. cascadenis*
Folia adulta haud persistentia et plantae aliis signis diversae.

Stigmata linearia, elongata, stylo tenui satis longo pl.m. 2-3plo breviora; ovaria fructusque saepe

tantum ad apicem sparse pilosi, ceterum ut supra sub *S. stolonifera* indicata

17. *S. stolonifera* f. *subpilosa*

Stigmata brevia vel oblonga sed vix linearia vel plantae aliis signis diversae.

Folia subtus (in sicco) paullo pallidiora (haud distincte glaucescentia vel albescentia), leviter elevato-nervata sed vix reticulata, laevia, petiolis vix 5-6 mm. longis instructa, vulgo lanceolata vel elliptico-lanceolata, utrinque acuta vel apice obtusa, superne stomatifera et interdum fere inciso-nervata, etiam maxima vix ad 4:1.8 cm. magna, integerrima (rarissime versus basim parce denticulata); stipulae nullae vel minimae, caducae; amenta (pedunculo excluso) 2-4.5 (in var. *caespitosa* interdum ad 6) cm. longa et fructifera ad 1.3 cm. crassa; ovaria subsessilia, dense sericeo-villosa; stylus distinctus, saepe apice breviter bifidus, stigmatibus oblongis bifidis vulgo duplo rarius 3plo longior; glandula ventralis oblonga, ovoideo-conica; fructus pedicello brevi glandulam siccam subaequante excluso 4-5 mm. longi; fruticulus ramulis hornotinis flavescens tenuibus satis brevibus. . . 13. *S. petrophila*

Folia subtus distincte discoloria, glaucescentia, pruinosa, superne haud stomatifera vel majora, diversiformia vel plantae aliis signis diversae.²

Glandula ventralis satis brevis et lata, vix duplo altior quam lata, apice late truncata, pedicello fructuum duplo brevior; amenta submatura vel fructifera (3-)5-10:1.2-1.6 cm. magna; ovaria tenuiter villosotomentella; styli distincti, apice bifidi, stig-

² It is difficult to indicate in such a key the differences between *S. petrophila* and *S. anglorum* and its different forms with sufficient clearness. See my remarks under those species in my first paper (*l.c.*).

matibus oblongis bifidis paullo vel duplo (rarius fere triplo) longiores; fructus pedicello excluso 6.5–8 mm. longi; folia superne estomatifera, margine vulgo partim sparse et saepe obsolete denticulata, forma variabilia, majora latiora ad 3–4(–5):2.5(–3) cm. magna; frutex procumbens ramulis saepe satis elongatis, 2–3 mm. crassis (si glandula est brevis et lata sed pedicello brevior, confer 18a. *S. hudsonensem*) 18. *S. arctophila* Glandula oblonga, vulgo 2½–4plo longior quam lata et pedicelli etiam fructuum quam glandula pl.m. breviores vel rarius sublongiores vel plantae aliis signis diversae.

Amenta fructifera ellipsoideo-globosa, circ. 1–1.5:1.5 cm. magna; folia subcoriacea, late ovalia vel obovato-rotunda, vix ultra 1.8:1.5 cm. magna, superne estomatifera, in sicco tenuiter reticulata, subtus valde elevato-reticulata, utrinque (saltem initio) ut ramuli novelli villosula

16b. *S. ovalifolia* var. *pubescens*

Amenta fructifera cylindrica, vulgo longiora, tenuiora; folia tenuiora vel majora, subtus nunquam conspicue elevato-reticulata.

Folia superne haud stomatifera,³ vulgo obovata vel obovato-oblonga, apice rotundata ad subacuta vel plicato-acuta, basi sensim vel subito attenuata, obtusa vel interdum rotundata, majora satis evoluta 3–6:2–4 cm. magna; petioli 9–20 mm. longi; stipulae in ramulis vegetis ovato-lanceolatae vel lanceolatae,

³ With the exception of *S. arctica* var. *subcordata*, which, however, is easily distinguished from any of the forms of *S. anglorum* by its much larger leaves and longer stouter catkins.

integrae vel subdenticulatae, 2-12 mm. longae; amenta sub anthesi 2.5-4 cm. longa, bracteis atris dense longe sericeis conspicua, fructifera 6:1.3 ad 9:1.8 cm. magna; ovaria sessilia vel subsessilia, sericeo-villosa; styli distincti, vulgo integri, quam stigmata oblonga bifida 2-2½plo longiores; fructus pedicello brevi glandula $\frac{2}{3}$ ad vix brevior (rarissimo sublongiore) excepto (6-)8-10 mm. longi (confer etiam 16c. *S. ovalifoliam* var. *subarcticam* et 18a. *S. hudsonensem*)

15. *S. arctica* et varietates
Folia superne stomatifera, vulgo minora, valde variabilia (vide formas sub *S. anglorum* enumeratas); petioli vix ultra 10 mm. longi; stipulae nullae vel minores; amenta etiam fructifera vix ad 5.5: 1.5-1.8 cm. magna, saepe distincte minora, tenuiora; fructus ad 7-8 mm. longi pedicello subnullo vel glandula 2 ad $\frac{1}{3}$ plo brevior excluso (si folia sunt estomatifera sed plantae aliis signis haud diversae, confer etiam 18a. *S. hudsonensem*)

14. *S. anglorum* et varietates
β) Bractee concolores, flavescetes, stramineae vel brunnescentes (rarius subbicolores, apice violaceae vel leviter fuscae), semper breviter sericeo-villosulae (id est pilis quam bractea brevioribus instructae), intus interdum glabratae.
(1) Petioli brevissimi, 1-2 vel vix ultra 2.5 mm. longi, gemmas bene evolutas non superantes et stipulae petiolis aequilongae vel duplo longiores; amenta florifera minima vel parva, etiam fructifera vix ad 2.5:1-1.2 (vel in *fullertonensi* ad 4:1.3) cm. magna.
Frutex prostratus ramis repentibus; folia breviter

lanceolata, elliptico-oblonga vel oblonga, utrinque pleraque acuta, 1:0.5 ad 3:0.9-1.2 cm. magna, superne vulgo sparse stomatifera; stipulae distinctae; ovaria sessilia vel subsessilia, villosulomentosa; stylus satis brevis, integer vel apice bifidus stigmatibus oblongis bifidis subaequilongus; bracteae oblongae; glandula dorsalis anguste conica, interdum pl.m. bifida, iis duplo brevior; fructus subsessiles, 4.5-6 mm. longi

19. *S. fullertonensis*

Frutices parvi erecti, ramis saepe satis brevibus subtortuosis divaricatis vel subelongatis strictioribus et plantae aliis signis diversae.

Folia superne stomatifera, oblonga, ad 3:1 cm. magna adulta etiam subtus satis glabrata; bracteae intus glabrae, late ovaes vel obovaes; stylus distinctus quam stigmata vulgo ultra duplo longior; ovaria sessilia, saepe infra medium glabra; ramuli hornotini satis glabrescentes. 21b. *S. chlorolepis* var. *antimima*
Folia superne haud stomatifera, magis (saltem subtus) villosa vel sericeo-villosa; ramuli hornotini semper pl.m. dense villosu-tomentosi; bracteae vulgo utrinque pilosae vel interdum extus glabriores.

Ramuli hornotini densissime albo-sericeo-villosi; styli ovariorum sessilium, brevissimi, vix ad 0.5 mm. longi, stigmatibus brevibus; folia oblongo-lanceolata vel anguste ovato-lanceolata, apice (infimis exceptis) pl.m. acuta, basi rotundata vel obtusa, 1.5:0.5 ad 3.5:0.9-1 cm. magna, novella utrinque sericeo-villosa; species satis imperfecte cognita. 20. *S. niphoclada*

Ramuli hornotini vel vulgo tantum novelli minus dense griseo-vel subflavescenti-sericeo-villosi; styli distinctiores, stigmatibus aequi-

longi vel saepe distincte longiores; folia elliptico-oblonga, oblanceolata, rarius ovato-vel elliptico-lanceolata, interdum obovato-oblonga, apice obtusiuscula vel subito breviter acuta, basi late cuneata vel obtusa, rarius rotundata ad subcordata, sub anthesi saepe minima vel parva, subspathulata vel linearilanceolata, ad 2.5-3:(0.6-1) vel 3.4:0.8 vel ad 3:1.1 (maxima ad 4.5:1.2) cm. magna; amenta sub anthesi vix ultra 10:4 mm., fructifera 1.5:0.8 ad 2.5:1(1.2) cm. magna; fructus subsessiles vel pedicello glandula vulgo duplo brevior suffulti, 5-7 mm. longi

22. *S. brachycarpa*

- (2) Petioli gemmis vel stipulis longiores, amenta etiam florifera longiora vel plantae alio modo diversae. Folia parva vel mediocra, majora apice ramulorum vulgo haud ultra 4:1.8 cm. magna, lanceolata, oblanceolata, elliptico-lanceolata, anguste elliptica ad obovato-lanceolata, rarius elliptico-vel obovato-oblonga, apice acuta vel subacuta, basi cuneata ad rotundata, integerrima (infima minima tantum brevissime glanduloso-denticulata), superne stomatifera, novella pl.m. tenuiter griseo-villosula, demum glabrescentia vel subglabrata, subtus discoloria, glaucescentia, ut superne vel densius villosula (sed pubescentia satis variabili); stipulae nullae vel valde reductae; amenta sub anthesi 8-15:5 ad 25:6 mm., fructifera ad 2-3:1-1.5 cm. magna; fructus 6.5-8 mm. longi, pedicello brevi quam glandula duplo brevior (rarius ea subaequilongus) excluso; ramuli novelli griseo-villosuli vel subtomentosi, annotini saepe subglabri, purpurascentes vel fere nigro-castanei vel ut vetustiores epidermide griseo-flavescente pl.m. secedente obtecti (conf. etiam 23. *S. desertorum*, speciem tantum incomplete cognitam).....24. *S. pseudolapponum*
Folia majora vel latiora vel superne haud stoma-

tifera vel amenta fructifera majora et fructus 8-10 mm. longi pedicellis glandulam ad duplo superantibus.

Folia superne haud stomatifera.⁴

Fructus pedicello subnullo vel brevi glandulam haud superante suffulti, 6-8(-10) mm. longi; amenta sub anthesi 1-2.5:0.7 cm., fructifera ad 3-5:1.2-1.5 cm. magna pl.m. densa; folia (var. *atra* excepta) tantum $\frac{1}{2}$ ad $2\frac{1}{2}$ plo longiora quam lata, elliptica, ovalia, obovato-elliptica, obovato-oblonga, vel ovato-elliptica, apice pl.m. obtusa vel breviter acuta, basi obtusa vel late cuneata ad subcordata, 3:2 vel 3.5:2.5 vel 4.5:2-2.3 ad 6:2.8 cm. magna, novella pubescentia (minimis infimis exceptis) pl.m. villosa induta, superne glabrescentia, rarius adulta utrinque glaberrima 26. *S. cordifolia*

Fructus pedicello glandulam vulgo $\frac{1}{4}$ ad 2 plo superante instructi, 7-8(-9) mm. longi; amenta sub anthesi 2-4:0.8-1 cm., fructifera 3.5-7:1.5 cm. magna, basi saepe satis laxiflora; folia vulgo $2\frac{1}{2}$ ad ultra 4 plo longiora quam lata, lanceolata, oblanceolata, elliptico-oblonga, obovato-oblonga vel obovato-elliptica, apice obtusa vel vulgo acuta vel fere breviter acuminata, basi obtusa vel subito sensimve cuneata, mediocra 4.5:2 ad 5:1.5 vel 7:2.3 cm. magna, novella pubescentia satis sericea induta, superne paullo vel omnino glabrescentia, subtus saepe glabriora

25. *S. glaucae* varietates

Folia superne stomatifera, ceterum ut in vol. 66, p. 349 descripta 27. *S. anamesa*

⁴ Owing to the variability of the nos. 24-26 and our insufficient knowledge of the Greenland forms I cannot avoid using this anatomical character in distinguishing *S. anamesa* from the other two species. But *S. anamesa* is apparently a species met with only in Greenland, and therefore the arrangement of the key will not be inconvenient to most of the students of American willows.

2. SECUNDUM SPECIMINA MASCULA⁵

A. Filamenta omnino glabra

I. Stamen unicum (rarissime stamina 2 adsunt); bracteae pl.m. purpurascens et apice atrae, pilis longis argenteis sericeae; folia adulta glabra, discoloria, superne pl.m. nitida et stomatifera, pl.m. crenato-denticulata, rariter ad 2.5 cm. longa; frutex depressus vel prostratus 6. *S. Uva-ursi*

II. Stamina semper 2.

a. Fruticuli minimi, suffruticosi, ramulis tenuissimis, fere semper radicantibus; folia utrinque concoloria v. subconcoloria, etiam superne stomatifera, minima vel parva, rarius ultra 25 mm. longa latave; amenta serotina, tenuia, pauci- (rarius multi-) flora.

Folia utrinque obtusa vel acutiuscula (cuneata), integra, nervis primariis superne tenuissime incisus subtus prominentibus, ceterum enervia, 5-8:3-4 mm. magna; amenta 3-5-flora, rhachi bracteisque concoloribus glabris vel parcissime pilosis; glandulae 2 11. *S. Dodgeana*
Folia utrinque rotundata vel basi cordata vel utraque facie distincte (sed saepe tenuiter) reticulata.

Ramuli breves floriferi fere semper bifoliati; folia adulta sicca haud per secundum annum persistentia; ramuli vetustiores 1-2 mm. crassi.

Bracteae glabrae subglabrae, concolores, flavescens vel violascentes; glandulae 2; folia semper crenato-serrata 8. *S. herbacea*

Bracteae sericeo-villosulae, fuscae, pl.m. bicolores; glandula 1, ventralis; folia saepissime integerrima

5. *S. polaris*

Ramuli floriferi 2-5-foliati; folia adulta sicca pl.m. marcescentia, fuscescentia et per secundum annum persistentia, integerrima; glandulae fere semper 2 (in *S. cascadiensis* ut videtur tantum 1).

⁵ Of the following species the male plant is still unknown: *fullertonensis*, *hudsoniensis*, *leiolepis*, *lingulata*, *Peasei*, and *venusta*.

Amenta minima, 3-8-flora; folia vulgo orbicularia vel late ovalia, utrinque rotundata, vix ad 11:10 mm. magna, adulta sicca anno secundo decidua

9. *S. rotundifolia*

Amenta multiflora, ad 23 mm. longa; folia adulta plures annos persistentia vel pl.m. lineari-lanceolata.

Folia elliptica, obovato-oblonga vel late spathulata, apice rotundata vel breviter acuta, basi cuneata, subtus vix pallidiora, ad 15:9 mm. magna.....19. *S. phlebophylla*

Folia lingulata, lineari vel anguste lanceolata (vel oblanceolata), apice vulgo subplicato-acuminata, ad 18:5 mm. magna, subtus subpallidiora

12. *S. cascadenis*

b. Fruticuli vel frutices vel folia discoloria vel plantae alio modo diversae.

1. Bractee pl.m. discolores, apice vel pro parte maxima fuscae, versus apicem longe sericeae (pilis longis sericeis quam bractea vix vel paullo brevioribus instructae), interdum apice tantum longe ciliatae; fruticuli vel frutices parvi, ramis prostratis, pl.m. radicanibus vel subterraneis, ramulis tantum floriferis pl.m. adscendentibus, vix ad 15-20 cm. altis (vel in *S. arcticae* formis interdum altioribus); si folia sunt tenuiter sed dense et acute glanduloso-serrulata, vide

29. *S. Chamissonis*

- a) Folia subtus (in sicco) paullo pallidiora, leviter elevato-nervata, sed vix reticulata ceterum ut in p. 56 descripta; amenta 1-2.5 cm. longa, vix ad 1 cm. crassa, pluri- vel multiflora; glandula ventralis pl.m. elongato-conica, dorsalis saepe nulla

13. *S. petrophila*

- β) Folia subtus distincte discoloria, glaucescentia vel albescentia, adulta pl.m. reticulata vel longius petiolata vel majora et forma diversa (specimina mascula specierum sequentium sine speciminibus

femineis accurate discernere saepe impossibile est).⁶

- (1) Glandula ventralis satis brevis lataque, vix 2plo longior quam lata, apice late truncata, quam bractea obovata vulgo $2\frac{1}{2}$ -3plo brevior;⁷ amenta 2-2.5:0.8-1 cm. magna; folia tantum novella subtus sparse sericea, cito glabra, superne stomatifera, ceterum ut in p. 57 descripta; petioli vix ultra 8 mm. longi

18. *S. arctophila*

- (2) Glandula ventralis pl.m. anguste ovato-rectangularis vel anguste conica, apice saepe leviter incrassato truncata, quam bractea vix duplo brevior vel folia superne stomatifera, semper integerrima vel plantae aliis signis diversae.

Amenta perfecte evoluta vix ultra 1.5:0.8 cm. magna; folia matura satis crasse papyracea, subtus pl.m. perspicue et anguste reticulata, vulgo elliptica, late elliptica, obovalia vel rotundata, vix ultra 2.5:1.2-2 cm. magna; stipulae nullae (vel minimae punctiformes) (si folia superne stomatifera confer. etiam 14. *S. anglorum* formas et 30. *S. glaciale*m speciem valde incomplete cognitam).

Folia superne pl.m. stomatifera; ramuli annotini hornotinique vulgo breves; rami saepe stolones subterraneos tenues vix ad 1 mm. crassos emittentes. . 17. *S. stolonifera*
Folia superne haud (var. *camdensis* excepta) stomatifera; ramuli hornotini annotinique pl.m. elongati, rami ut videtur haud stoloniferi. 16. *S. ovalifolia*

⁶ Of course if their exact locality is known, we shall certainly be able to determine even young male branchlets.

⁷ The shape of the ventral gland is often rather variable in any species because the gland may be more or less lobate, bifid, or bipartite.

Amenta perfecte evoluta vulgo ultra 1.5 et ad 4-5 cm. longa et 1-1.3 cm. crassa, bracteis longe et dense pilosis satis sericea; folia matura majora vel tenuiora et subtus vix reticulata, juvenilia magis sericea vel sericeo-villosula, vel stipulae (saltem in ramulis vegetis) pl.m. distincte evolutae.

Folia superne haud stomatifera (var. *subcordata* excepta quae foliis amentisque maximis a *S. anglorum* valde differt) ceterum ut in p. 56 descripta; amenta 1.5-5:1.3 cm. magna; ramuli pedunculiferi vulgo 2-4 mm. crassi (confer etiam 16c. *S. ovalifoliam*, v. *subarcticam*)

15. *S. arctica*

Folia superne stomatifera, ceterum ut in p. 56 descripta; ramuli pedunculiferi 1 ad vix 2 mm. crassi (confer etiam 27. *S. anamesam* e Groenlandia). . 14. *S. anglorum*

2. Bracteae pl.m. concolores, flavescences et fere glabrae vel stramineae flavobrunnescentesve et pl.m. breviter sericeo-villosae (pilis quam bractea brevioribus instructae) vel subdiscolores sed tantum villosae vel pilis sericeis vulgo tenuissimis praeditae; frutices prostrati vel saepe erecti, 0.3-1 m. alti.

Amenta minima vel parva, 5-10 mm. longa vel in *niphoclada* ad 22:4 mm. magna et laxiflora; petioli vix ultra 2 mm. longi.

Folia parva, vix ad 2.5 cm. longa et ad 1.4 cm. lata, superne stomatifera, stipulae ut videtur nullae; bracteae flavescences vel stramineae, subglabrae vel extus dense breviter pilosae; glandulae 2

21. *S. chlorolepis*

Folia saepe ad 4 cm. longa, superne haud stomatifera; stipulae vulgo evolutae; bracteae stramineae, utrinque brevipilosae; glandulae 2

20. *S. niphoclada*

Amenta 1. 2-3.5 cm. longa, ultra 5 mm. crassa; petioli vulgo ultra 2 mm. longi; confer formas diversas sub 24. *S. glauca*, 25. *S. cordifolia*, et 26. *S. anamesa* enumeratas.

B. Filamenta pl.m. pilosa (interdum ima basi tantum pilis paucis instructa)

I. Amenta serotina, pseudoterminalia, anguste cylindrica vel minima pauciflora, pedunculis nudis iis saepe subaequilongis suffulta; bractee breviter (rarius longius) pilosae, pl.m. concolores, flavescentes vel violaceae; folia satis crassa, superne saepe pl.m. inciso-reticulata, haud stomatifera, subtus distincte elevato-reticulata, pl.m. longe petiolata; glandulae 2 vel interdum plures pseudodiscum lobulatum formantes.

Bractee intus pl.m. brevopilosae vel utrinque sericeae; folia coriacea, pleraque vix longiora quam lata vel ultra 4 cm. longa, superne conspicue inciso-reticulata, rugosa.

Frutex prostratus; folia cito glaberrima vel rarius pilis paucis sericeis obsita, vix ad 5:5.5 cm. magna et petiolis elongatis ad 3 cm. longis instructa; bractee intus tantum brevi-pilosae; antherae violaceae 1. *S. reticulata*

Frutex prostratus vel erectus; folia etiam adulta subtus dense sericea vel majora, magis oblonga, margine distincte crenata, vel petioli breves gemmis vix longiores; bractee utrinque pl.m. sericeae; antherae flavae 2. *S. vestita*

Bractee glabrae vel tantum parce ciliatae; folia tenuiora, minima vel distincte longiora quam lata, vix ultra 3.5:2 cm. magna, superne vix vel indistincte inciso-reticulata; frutices prostrati, interdum minimi, suffruticulosi

4. *S. nivalis* et var. *saximontana*

II. Amenta coetanea, rarius serotina, lateralialia, ovata vel cylindrica, semper multiflora, sed interdum parva, pedunculis semper foliatis.

Folia brevissime petiolata, petiolis vix ultra 2.5 mm. longis vel quam gemmae evolutae pl.m. brevioribus, ceterum ut in p. 58 indicata; amenta sub anthesi 5-10(-15):2-8(-9) mm. magna; antherae minimae, ellipsoideo-globosae

22. *S. brachycarpa*

Folia distinctius petiolata; amenta vulgo ultra 15 mm. longa, crassiora vel antherae magis ellipsoidales oblongiores et folia superne pl.m. stomatifera (specimina mascula specierum sequentium sub anthesi sine foliis perfecte evolutis accurate discernere saepe impossibile videtur; confer etiam 28. *S. lingulatam* speciem incertam alaskanam).

Folia superne pl.m. (interdum tantum sparse secundum nervos) stomatifera, vulgo oblonga, $2\frac{1}{3}$ –4plo longiora quam lata, sed vix ultra 4:1.8 cm. magna.

Amenta pedunculis vix ad 1 cm. longis suffulta, 8–15:7 mm. magna, densiflora; folia pedunculorum (saltem subtus) dense breviter sericea vel villosula (confer etiam 27. *S. anamesam* e Groenlandia). . . . 23. *S. pseudolapponum*

Amenta saepe longius pedunculata, 1.5–3.5:0.8–0.9 cm. magna et basim versus laxiflora vel folia pedunculorum etiam subtus glabra vel subglabra. . . . 24. *S. desertorum*

Folia superne haud stomatifera, majora, latiora vel longiora.

Amenta deflorata ad fere 3.5 cm. longa, basi vulgo pl. m. laxiflora vel folia pedunculorum satis oblonga, circ. $2\frac{1}{2}$ – $3\frac{1}{2}$ plo longiora quam lata. . . . 25. *S. glaucae* varietates

Amenta deflorata vulgo haud ultra 2(–2.5) cm. longa, etiam basi densiflora vel folia pedunculorum latiora brevioraque vix ad $2\frac{1}{2}$ plo longiora quam lata

26. *S. cordifolia*

Enumeratio sectionum specierumque

I have omitted from the keys and the following enumeration the well known and easily recognizable *S. candida* Flügge which BALL (1909) includes in his section ARCTICAE, because I attribute to it a different systematic position.

Sect. I. RETICULATAE⁸ Fries in Sylloge Pl. Nov. Soc. Ratisb. 2:38 (Consp. Disp. Salic. Suec.). 1828, quoad *S. reticulata*; for

⁸ There is the older name *Chamaetia* given by DUMORTIER in Bijdr. Natuurk. Wetensch. 1:56 (Verh. Gesl. Wilgen 15) 1835 to a group, including *S. retusa*, *S. herbacea*, and *S. reticulata*. Unfortunately neither the International Rules nor the Philadelphia Code contains a precise rule in regard to the application of names of sections or similar groups. I do not accept DUMORTIER'S name because in his paper he proposes two very different arrangements, and he does not in my opinion make a definite statement.

further literature see SCHNEIDER in SARGENT, Pl. Wils. 3:146. 1916. —This section, which is represented in America by the following 4 species, is a well defined group. The rather exceptional position of *S. reticulata* among the other willows, which once led A. KERNER to propose the new genus *Chamitea* for it, becomes less marked by the addition of the American *S. nivalis*; and the characters of the RETICULATAE are further changed by the inclusion of *S. leiolepis* with glabrous ovaries. *S. glacialis* referred by RYDBERG to this section is a very imperfectly known species, of which the systematic position is still doubtful.

I. *S. RETICULATA* L., Sp. Pl. 2:1018. 1753.—*S. reticulata a glabra* Trautvetter in LEDEB., Fl. Alt. 291. 1833.—*S. reticulata b normalis* And. in Öfv. K. Vet.-Akad. Förh. 15:133 (Bidr. Känned. Nordam. Pilarter). 1858.⁹—*S. reticulata a typica* 1. *glabra* And. in DC., Prodr. 16²:301. 1868.—This willow has the most extensive range of all the known species. In Europe it is reported from the high Pyrenees through the whole range of the Alps to the mountains of Croatia, and northward to Scotland, Scandinavia, Iceland, Spitzbergen, and Arctic Russia, while in Asia it is found on the high mountains from the Ural to Kamchatka and in the Arctic zone from Taimyr Peninsula to the Bering Strait. According to LANGE it does not occur in Greenland. In North America I have seen specimens from southern Labrador, western Newfoundland, the northern shores of the Hudson Strait, and the western shore of Hudson Bay to the Coronation Gulf and Bernard Harbor (114°46' W. long.), and west of 135° W. long. from the Yukon Territory (King Point and Herschel Island to Lake Bennett) and from Alaska. Here it stretches, as COVILLE has said, over the Arctic zone, but including the extreme north (Camden Bay), and southward it occurs at timber line on the mountains from the Juneau region to Kodiak Island, and westward to the Aleutian, Pribilof, and St. Matthew Islands. There is also a specimen from the "Rocky Mountains" (no. 85 Herb. H.B.T., ex Herb. Torrey in N.; m., f.), the exact locality of which is unknown to me. No. 86 also

⁹ The same article has been published with slight alterations in the same year in Proc. Amer. Acad. 4:50 (Salic. Bor.-Am.) and in Walper, Ann. Bot. 5:744. I do not always repeat these quotations.

of the same collection is a female specimen which seems to represent a very small form of *S. reticulata* somewhat similar to *S. nivalis*, but showing a distinct reticulation of the leaves. It needs further observation and has already been mentioned by RYDBERG (1899), who also cites a specimen of MACOUN (18849, O.) from Silver City in the Rockies, a locality I have not yet been able to identify. Otherwise it is replaced in the Rockies by *S. nivalis* and var. *saximontana*.

The name *S. orbicularis* has been given by ANDERSSON (in DC., Prodr. 16²:300. 1868) to the *S. reticulata* "in Kamtschatka et in America boreali-occidentali ut ad Sitchka et Unalashka." RYDBERG (in Bull. N.Y. Bot. Gard. 1:260. 1899) accepted this name for almost all the American material of *S. reticulata*, citing only three specimens "which may be referred" to LINNAEUS' species. But I agree with COVILLE (in Proc. Wash. Acad. Sci. 3:342. 1901) that the distinguishing characters assigned by ANDERSSON as well as those given by RYDBERG are insufficient "to see in our American plant a species distinct from the European." If we wish to distinguish the form with more or less orbicular leaves we may use the name *S. reticulata subrotunda* Seringe (Essai Mon. Saules Suisse 29, 1815) based on *S. reticulata* Hoffmann (Hist. Salic. 1: pl. 25, fig. 3. 1787). Other variations of this species which have been observed in the Old World are not represented among the American material before me and are not mentioned by previous authors.

2. *S. VESTITA* Pursh, Fl. Amer. Sept. 2:610. 1814.—*S. reticulata a vestita* And. in Öfv. K. Vet.-Acad. Förh. 15:133. 1858, excl. specim. e Siberia et Helvetia.—*S. vestita a humilior* And. in DC., Prodr. 16²:300. 1868, excl. specim. altaica.—The range of this well known species extends (including the form mentioned later) in the east from northern Labrador southward to western Newfoundland, Anticosti, and the Gaspé Peninsula, and I saw it also from the west shore of Hudson Bay (Churchill, lg. *J. M. Macoun*, no. 79143, O., m., f.; Cor., G.), while in the west it reaches its northern limit in the Rockies of Alberta and British Columbia toward the 52d parallel, extending southward to northwestern Montana and the Wallowa Mountains in eastern Oregon. The western forms have been called *S. Fernaldii* by BLANKINSHIP (in Mont. Agric. Coll. Sci. Stud.

1:46. 1905), which name is adopted by RYDBERG (Fl. Rocky Mts. 198. 1917), although he says "perhaps not distinct from the eastern *S. vestita* Pursh." It certainly cannot be distinguished specifically, and if we intend to apply a special denomination to the more erect form with rather "thinner, narrower, rounded or pointed leaves," we have to use the name var. *erecta* And. (in DC., Prodr. 16²:300. 1868). The aments are usually longer than in the eastern form, but there are specimens before me from Alberta (lg. REHDER and also JACK) with the same short fruiting catkins. Professor FERNALD kindly pointed out that the shape of the capsules of typical *vestita* is more ovoid-conical, with a rather pointed apex, while it is more ovoid-ellipsoid, with an obtuser apex, in var. *erecta*. There seem to be rather intermediate forms, but as a whole this character may be taken for the best one to distinguish these eastern and western forms.

Another form has been collected by FERNALD and ST. JOHN in western Newfoundland which seems closely connected with the next species, but its description has not yet been published and it needs further observation.

3. *S. LEIOLEPIS* Fernald in *Rhodora* 16:178. 1914.—This is a very peculiar species, which was discovered by FERNALD and ST. JOHN on the Table Mountain, Port à Port Bay, in western Newfoundland, July 17, 1914, on "mossy knolls on the limestone tableland, alt. 200–300 m." (no. 10825, fr.; G.). In habit and foliage it closely simulates, as the author said, *S. reticulata* and the most dwarfed alpine extreme of *S. vestita*; but it differs "from both in the glabrous scales and capsules; also from *S. reticulata* in its short peduncles and thick fruiting aments, and from *S. vestita*, which is the most abundant willow of Table Mountain, in its glabrous or quickly glabrate foliage and the smaller and more slender, glabrous, greenish terminal buds." As the type specimen shows, the ovaries are sometimes sparsely pubescent, the bracts frequently provided with a few cilia, the styles very short but more or less distinct, and even the old leaves bear some hairs on the lower surface which are often rather difficult to recognize. Unfortunately the male sex is still unknown; consequently I cannot decide whether *S. leiolepis* is to be regarded as a good species or as a glabrate variety of *S. vestita*,

representing a rather dwarfed alpine form. The glabrousness or pubescence of the ovaries, a character on which usually so much reliance is placed, cannot always be taken for a decisive taxonomic character. In my notes on the species of the section OVALIFOLIAE (*l.c.*) I was able to show that many species with hairy ovaries develop a more or less glabrescent or glabrous variety, or vice versa.

4. *S. NIVALIS* Hooker, Fl. Bor.-Am. 2:152. 1839; Nuttall, N. Am. Sylva 1:77. *pl. 19, fig.* sinistra inferior. 1843; Rydberg in Bull. N.Y. Bot. Gard. 1:262. 1899; Ball in Coult. and Nels., New Man. Rocky Mt. Bot. 139. 1909.—*S. reticulata* c *nana* And. in Öfv. K. Vet.-Akad. Förh. 15:133. 1858, excl. specim. e Groenl. et Spitzb.—*S. reticulata* β *nivalis* And. in DC., Prodr. 16²:301. 1868.—The type of this “elegant and very diminutive shrub” (NUTTALL) was collected “near the summits of the peaks in the Rocky Mountains” by DRUMMOND between lat. 52–56°. It occurs most frequently in the alpine region of the Rockies of Alberta and British Columbia, and to a certain degree also on the Tobacco Root Range (Pony Mountains), on Observation Mountain and Mt. Chauvet in southern Montana, and on the Electric Peak in northern Yellowstone Park. It is also mentioned by PIPER from Mt. Rainier, Washington. There are a few specimens from Colorado (*E. L. Greene*, no. 517, m.; G.; probably from near Golden City) and from southeastern Utah (*Rydberg* and *Garrett*, no. 8787, m., f.; N.; La Sal Mts., West Mt. Peale) which I can hardly distinguish from typical *S. nivalis*, and which, in my opinion, form connecting links between it and *S. saximontana* Rydbg. I take this last species, therefore, only for a variety of *S. nivalis*, from which it chiefly differs by the characters given later. RYDBERG himself said (1899) that *S. nivalis* “perhaps represents only the most depauperate form” of his *S. saximontana*, and he repeats in his Cat. Fl. Mont. 112. 1900 that the latter “seems to grade into *S. nivalis*,” while such an accurate observer as PIPER (in Contr. U.S. Nat. Herb. 9:216. 1906) states that “*S. saximontana* probably is not specifically distinct from *S. nivalis*.”

4b. *S. NIVALIS* var. *saximontana*, nov. var.—*S. reticulata* Bebb in Coulter, Man. Rocky Mt. Bot. 339. 1885, non L.; Ball in Trans. St. Louis Acad. Sci. 9:90. 1899.—*S. saximontana* Rydberg in Bull.

N.Y. Bot. Gard. 1:261. 1899; Ball in Coult. and Nels., New Man. Rocky Mt. Bot. 139. 1909.—*S. aemulans* v. Seemen in Bot. Jahrb. 29: Beibl. 65:28. 1900.—A typo praecipue differt: ramis crassioribus (interdum ad 19 mm. crassis), foliis majoribus vulgo 1.5–3.5 cm. longis et 0.8–2 cm. latis interdum minus reticulatis forma ut in typo valde variabilibus (lanceolatis saepe apice subacutis), petiolis ad 1.8 cm. longis; amentis pluri- vel multifloris masculis 7–12 mm. longis pedunculis vulgo longioribus sparse pilosis exclusis, femineis 8–18 mm. longis fructiferis fere ad 1 cm. crassis.

The type came from Gray's Peak in Colorado (lg. RYDBERG, August 1895, m.; N.), and it is most abundant in the Rockies of this state, reaching its southernmost point on the Truchas Peak of the Taos Mountains in northern New Mexico. Northward its range extends through western Wyoming, Yellowstone Park, and southern Montana to the vicinity of Laggan in Alberta and Skagit Valley in British Columbia, while toward the west it is found on Mt. Rainier in Washington, on the Strawberry and the higher Wallowa Mountains in eastern Oregon, furthermore on the East Humboldt Mountains in northeastern Nevada, and also in Boxelder and Utah counties and on the La Sal Mountains in Utah.

Sect. 2. HERBACEAE Borrer in Hooker, Brit. Fl. 432. 1830 (Sect. CHAMAETIA Dumortier, pro parte, see note 8 on p. 43; sect. RETUSAE Kerner in Verh. Zool. Bot. Ges. 10:195 [Niederöstr. Weid.]. 1860; for further literature see SCHNEIDER in Sargent, Pl. Wils. 3:142. 1916).—As I have already explained (*l.c.* 143), it seems to me impossible to separate the sect. RETUSAE from the HERBACEAE, but there are the following species which have been added to this group or might be regarded as closely related to its members: *S. cascadiensis*, *S. Dodgeana*, *S. glacialis*, *S. Peasei*, *S. polaris*, *S. phlebophylla*, *S. rotundifolia*, and *S. Uva-ursi*. Of these species *S. rotundifolia* seems to show the most intimate affinity with *S. herbacea*, but it is distinguished by the persistent leaves, a character also found in *S. phlebophylla*, *S. cascadiensis*, and *S. Uva-ursi*. From the last three species *S. Uva-ursi* seems to be widely separated by its bicolor leaves and the single stamen of the male flowers, while on the other hand they all have bicolor or fuscous bracts which are concolor, greenish or yellowish (or partly purplish

toward the apex) in *S. herbacea*, *S. Dodgeana*, and *S. retusa*. The systematic position of *S. polaris* is even more puzzling. Some authors are inclined to regard it as nothing but a variety of *S. herbacea* because the vegetative characters of both are so similar; but if we base our opinion on the flowers we may come to a very different conclusion; and in Sargent, *l.c.* 319, I have included this species in the sect. MYRSINITES Borrer. If we pay much attention to the presence or absence of a dorsal gland in the male flowers, we might also refer *S. Uva-ursi* to this section, but this willow occupies a rather unique position among the American species. With my present knowledge I deem it best to leave the question of the correct limitation of this section and of the true systematic position of these species undecided until I have had opportunity to discuss this problem with such an eminent salicologist as S. J. ENANDER, who is preparing a monograph of the whole genus. I have already published (Oestr. Bot. Zeitschr. 65:273. 1915) a short note on the systematic arrangement of the genus and discussed briefly the views taken by ANDERSSON and VON SEEMEN. The main purpose of that note was to show that no systematic grouping on natural lines can be attained unless we make use of every taxonomic character.

5. *S. POLARIS* Wahlenberg, Fl. Lapp. 261. *pl.* 13. *fig.* 1. 1812; Rydberg in Bull. N.Y. Bot. Gard. 1:264. 1809; Coville in Proc. Wash. Acad. Sci. 3:335. *fig.* 27. 1901.—? *S. herbacea* var. *polaris* Kurtz in Bot. Jahrb. 19:475. 1894.—In America this species is only known from the Alaskan coast of Bering Strait, where it has been collected at Port Clarence and Cape Vancouver. I have seen only the Port Clarence specimens of *Trelease* and *Saunders* (nos. 3387, f., 3385^a, m.), which have been described by COVILLE. They seem to agree with specimens of S. J. ENANDER'S *Salic. Scand. Exsicc.* from Spitzbergen, especially with no. 12 "modificatio foliis subovalibus." The ovaries of no. 3387 are partly glabrate, and I cannot at present say whether the American *S. polaris* is the typical form or not. As to its uncertain systematic position see my preceding remarks.

LUNDSTRÖM (apud KJELLMAN in Nordenskjöld, Vega Exp. Vet. Iakt. 2:21 [Fanerog.-Fl. St. Lawrence-Ön.]. 1883) has described a *S. polaris* f. *subarctica* "foliis tenuioribus, subtus margineque pilis

longis parce adpersis, squamis atris, obtusis; stylo elongato," the type of which was collected by KJELLMAN, July 31 to August 1, 1879, on the northwestern shore of St. Lawrence Island. I cannot interpret this form without having seen the type, and it is not mentioned by COVILLE or RYDBERG. There is, however, a specimen before me collected by R. L. Shainwald, Jr., on Mt. McKinley, 1200 m., August 26, 1903 (fr.; N.), which is very similar to *S. polaris* in every respect, but the fruiting aments measure up to 3 cm. in length and 9 mm. in width. The sessile fruits are 5-6 mm. long, pubescent only toward the apex, and the distinct withered style is a little longer than the stigmas. It looks to me like a new variety of *S. polaris* or a new species.

6. *S. UVA-URSI* Pursh, Fl. Amer. Sept. 2:610. 1814; Rydberg in Bull. N.Y. Bot. Gard. 1:278. 1899; Britton and Brown, Ill. Fl. 1:601. fig. 1477. 1913; Robinson and Fernald, Gray's New Man. 325. fig. 656. 1908.—*S. Cutleri* Tuckerman in Amer. Jour. Sci. 45:36. 1843; And. in Öfv. K. Vet.-Akad. Förh. 15:132. 1858; in DC., Prodr. 16:292. 1868.—*S. Myrsinites* var. *parvifolia* Lange, Consp. Fl. Groenl. 1:108. 1880; 2:278. 1887; Fl. Dan. 17:fasc. 51:13. pl. 3053. 1883, non And.—*S. ivigtutiana* Lundström apud Berlin in Öfv. K. Vet.-Akad. Förh. 41:89. 1884.—A well known willow, of which, however, as I said before, the systematic position is by no means settled. ANDERSSON said, "A *S. arbuscula* recedit foliis minimis parte superiore serrulatis, amentis subterminalibus et capsulis glaberrimis. Longius a *S. retusa* distat. Si ut ferunt auctores americani, flores masculi staminibus tantum singulis praediti sunt, tum affinitas cum *S. coesia* esset, cui etiam rigiditate et glaucescentia foliorum non absimilis, sed folia subserrata et capsulae glabrae." I have very rarely found two stamens in one flower, and I am at present unable to give a precise opinion as to the real relationship of this peculiar species. Its range stretches from New York (Mt. Marcy and Mt. Whiteface), Vermont (Camel's Hump, Mt. Mansfield), New Hampshire (White Mts.), and Maine (Mt. Katahdin) northward to the Gaspé Peninsula, southern and western Newfoundland and the whole coast of Labrador, apparently reaching the northern limit of its range at the southern shore of Baffinsland. Westward it extends through Ungava to the eastern

shores of Hudson Bay. The species has also been reported from southwestern Greenland by DURAND (in Jour. Acad. Nat. Sci. Phil. II. 3:197 [Pl. Kaneanae Groenl.] 1856), but LANGE (Consp. Fl. Groenl. 1:108. 1880) made the following statement: "*S. Uva Ursi* Durand ex descriptione (Pl. Kan.) ad formam nostram 3 [*S. arctophila lejocarpa*] retuli, etsi specimina Kaneana non vidi, quare dijudicare nequeo, an forsitan ad veram *S. Uva Ursi* Pursh pertineant, species, quae tamen a nemine alioquin in Groenlandia lecta esse constat." I am inclined to believe that KANE's specimens represented the true *S. Uva-ursi*, because this species is apparently identical with *S. Myrsinites parvifolia* Lange and *S. ivigtutiana* Lundstr. LANGE said that he did not see specimens of the typical *S. Myrsinites* L. from Greenland, and his var. *parvifolia* seems to be distributed from about the 70th parallel to the very south in Greenland. I have seen one specimen from the Tunugdliarfik Fjord, Kingua, lg. *L. K. Rosenvinge*, August 17, 1888 (fr.; G.), which fully agrees with LANGE's and LUNDSTRÖM's descriptions, and, in my opinion, cannot be separated from *S. Uva-ursi*, the presence of which may be expected in this part of Greenland. The leaves are distinctly glaucous beneath, while they are green and shining on both sides in *S. Myrsinites*. ANDERSSON's var. *labradorica* (1868) from near Oakak on Labrador is scarcely different from the type. He based it on *Hohenacker's* no. 92^c, which I have not yet seen. On the other hand, the forms referred to *S. Uva-ursi* by HOOKER (Fl. Bor.-Am. 2:152. 1839) seem to belong at least partly to *S. arctophila*, but I have as yet seen only a few leaves of *Morrison's* specimens in Herb. Bebb in C. which do not have stomata in the upper epidermis, as is always the case in PURSH's species.

7. *S. PEASEI* Fernald in *Rhodora* 19:223. 1917.—This willow is known only from the type locality in New Hampshire, southwest gully of King's Ravine on Mt. Washington, where it was first collected by *Pease* (no. 12091; the type is *Fernald* and *Pease*, no. 16847, fr.; G.). It is certainly a very peculiar species, and needs further observation, the male plant being still unknown. FERNALD's description is, as usual, ample and fitting. I am almost sure that it has to be regarded as of hybrid origin. I visited King's Ravine on September 18, 1918, and I found the willow growing in

about the altitude given by FERNALD on wet cliffs in company with *S. herbacea*. The main part of *S. Peasei* I saw was growing about 15-30 m. below *S. herbacea* on the southern slope of the ravine and covered a rather large area. *S. Uva-ursi* is very common at a somewhat higher level, but I collected plants of it which were growing just above the place where I saw *S. herbacea* and *S. Peasei* close together. Some plants of *S. Peasei* looked much like vigorous *S. herbacea*, while the main part of it lower down at first sight could easily be taken for *S. Uva-ursi*. FERNALD states that *S. Peasei* "finds itself at home on the almost inaccessible wet cliffs," and perhaps he did collect it somewhere else (but apparently not far from where I found it), because this place is by no means "almost inaccessible." Anyone who is a little careful not to start a stone avalanche and is not afraid of some steep climbing can easily visit this locality. Unfortunately the weather became misty and prevented my exploring the southwestern part of the ravine to a greater extent. On the southeastern slopes (toward the Madison Huts) I could not find a trace of either *S. herbacea* or *S. Peasei*, both species seeming to inhabit a very limited area. Under the lens the leaves, above as well as beneath, look as though very finely punctate owing to the presence of stomata. They are not "papillose," as the author says. These stomata are also present in *S. Uva-ursi*, but usually hardly visible except under the microscope.

8. *S. HERBACEA* L., Sp. Pl. 2:1918. 1753; Lange, Consp. Fl. Groenl. 1:107. 1880; 2:278. 1887; Rydberg in Bull. N.Y. Bot. Gard. 1:277. 1899; Robinson and Fernald, Gray's New Man. 325. fig. 65. 1908; Britton and Brown, Ill. Fl. ed. 2. 1:601. fig. 1478. 1913.—It has almost exactly the same range as *S. Uva-ursi*; it does not occur, however, in New York and Vermont, and I have not seen specimens from Newfoundland. On the other hand, it is met with on the western shores of Hudson Bay and in western as well as eastern Greenland. It is entirely absent from western North America, but in Europe and Asia its range is even more extensive than that of *S. reticulata*. PURSH (Fl. Am. Sept. 2:617. 1814) cites a specimen of *D. Nelson* from "the northwest coast" which I cannot identify.

9. *S. ROTUNDIFOLIA* Trautvetter in Nouv. Mem. Soc. Imp. Nat. Mosc. 2:304. *pl. 11* (De Salic. Frig. Kochii). 1832; Andersson in DC., Prodr. 16²:299. 1868; Rydberg in Bull. N.Y. Bot. Gard. 1:276. 1899; Wolf¹⁰ in Izv. S.-Petersburg Liesn. Inst. 5:112. *pl. 38. fig. 15-20. pl. 46. fig. 7-9.* 1900.—*S. polaris* var. *leiocarpa* Chamisso in Linnaea 6:542. 1831.—*S. retusa* var. *rotundifolia* Treviranus ex Trautv. in Nouv. Mem. l.c., pro synonym.; Trautvetter in Middendorff, Reise Sib. 1. pt. 2. Bot. Abt. 1:152 (Fl. Boganid. Phaen.) 1847.—*S. rotundifolia a typica* Lundström in Nov. Act. S. Sci. Ups. ser. 3. 1877. 30. *fig. 3.*—*S. leiocarpa* Coville in Proc. Wash. Acad. Sci. 3:338. *pl. 41. fig. 2.* 1901.—“This charming little plant . . . grows on the islands and both shores of Bering Sea and the Arctic Ocean, and above timber line on the Pacific coast of Alaska eastward to Prince William Sound,” and to these localities given by COVILLE is to be added Collinson Point on Camden Bay, where it was collected by *F. Johansen*, June 13, 1914 (no. 39 or 93811 O., m.). The typical form has glabrous ovaries, but two of the specimens before me represent a form with more or less hairy ovaries which I deem best to keep distinct as

f. *pilosiuscula*, f. nov. (ab typo ut videtur nonnisi ovariis partim vel omnino villosis differt). As type may be taken no. 3382 of *Trelease* and *Saunders*, from Hall Island, July 14, 1899 (f.; M.), to which no. 3383 from Matthews Island, July 15 (f.; M.), is to be added. The last specimen has a little longer styles with more or less slender stigmas, thus somewhat resembling *S. stolonifera*, but otherwise not differing from *S. rotundifolia*.

10. *S. PHLEBOPHYLLA* Andersson in DC., Prodr. 16²:290. 1868; Coville in Proc. Wash. Acad. Sci. 3:336. *fig. 28.* 1901.—*S. anglorum* Chamisso in Linnaea 6:541. 1831, pro parte, quoad specimin. citata; Trautvetter in Act. Hort. Petrop. 6:37. 1879.—*S. buxifolia* Trev. apud Trautv. in Nouv. Mem. Soc. Imp. Nat. Mosc. 2:301. *pl. 10.* 1832,

¹⁰ WOLF, one of our best salicologists, who was curator of the Imperial Institute of Forestry at Petrograd, at least until the outbreak of the war, has made some extremely valuable studies on European and Asiatic willows. Unfortunately his papers are written in Russian, but they are accompanied by excellent sketches. The title of his main paper is (translated) “Materials toward the study of the willows native to European Russia,” which appeared in two parts in 1900 in vols. 4 and 5 of the periodical quoted.

non Willd. apud SCHLEICHER.¹¹—*S. retusa* Hooker and Arnott, Bot. Beech. Voy. 130. 1832, non L.—*S. arctica* β *minor* Ledeb., Fl. Ross. 3:619. 1849–51.—*S. (retusa) phlebophylla* And. in Öfv. K. Vet.-Akad. Förh. 15:131. 1858, pro parte maxima.—*S. arctica* β *buxifolia* [recte *minor*] Ledeb. ex And. in DC., l.c. 290, pro synonym.—*S. palaeoneura* Rydbg. in Bull. N.Y. Bot. Gard. 1:267. 1899.—The history of this peculiar willow, which had been thoroughly described by TRAUTVETTER, is well given by COVILLE. ANDERSSON'S "species" is always quoted from 1858, but at this time he published the name *phlebophylla* only as a varietal designation, distinguishing 3 forms: *major*, *media*, and *minor*, which he rightly omitted in 1868. I saw a photograph and fragments of all his types preserved in Herb K. The f. *minor* may be represented by a specimen like Turner's no. 1293 in part (f.; G.), collected in 1879 on Atka Island. TURNER (Contr. Nat. Hist. Alaska 75. 1886) mentions a *S. rotundifolia* var. *retusa* from Atka Island, "with its heads of cottony catkins peering just above the surface of the other vegetation." I am not quite sure whether he refers to the form before me or not. RYDBERG has mentioned the specimen which I have seen under *S. Dodgeana*, but the leaves do not show the finely impressed veins on the upper surfaces, and the female flowers are very similar to those of *S. phlebophylla*, having, however, a dorsal gland. This form needs further observation, and the species has not yet been recorded so far south in Alaska, where it inhabits the northwestern and northern coast from Norton Sound to Point Barrow. According to COVILLE it was also collected on the Porcupine River by Turner in 1891, and SEEMANN (Bot. Voy. Herald 40. 1852) reported it from Pelly's Island at the mouth of the Mackenzie River. On the Siberian coast of Bering Strait C. Wright collected it on Arakam (or Kayne) Island. I have also seen a specimen from near Glacier in southeastern Alaska collected in June 1914 by Mary Milvain (m., f.; A.).

11. *S. DODGEANA* Rydbg. in Bull. N.Y. Bot. Gard. 1:277. 1899; Fl. Rocky Mts. 195. 1917; Ball in Coult. and Nels., New Man.

¹¹ According to SERINGE, Essai Mon. Saules Suisse 54. 1815, the name *S. buxifolia* Willd. was used first by SCHLEICHER, Cat. Sal. 1. 1809, where it is a nomen nudum, as well as in ed. 3 of SCHLEICHER'S Cat. Pl. Helv. 25. 1815. This name has to be used, so far as I understand it, for the hybrid *S. glauca* \times *S. reticulata*; see BRAND in Koch's Syn. D. Schw. Fl. ed. 3. 3:2357. 1907.

Rocky Mt. Bot. 131. 1909.—This delicate suffruticose species is only known from the type locality, Electric Peak, in the northeast corner of Yellowstone Park (lg. Rydberg and Bessey, August 18, 1897, f.; N.) and from Sheep Mountain in the Teton Forest Reserve, Wyoming (*F. Tweedy*, no. 292, fr.; N.). RYDBERG calls it "the smallest willow in existence," but there are similar minimis among the European (*S. serpyllifolia* Scop.) and Himalayan species (*S. oreophila* var. *secta* And.); see SCHNEIDER in SARGENT, Pl. Wils. 3:146. 1916. The systematic position of *S. Dodgeana* is not yet quite understood; it seems to represent a rather singular type among its American congeners. As to a doubtful pubescent variety, see my remarks under the following species.

12. *S. CASCADENSIS* Cockerell in Muhlenb. 3:9. 1907; Rydberg, Fl. Rocky Mts. 198. 1917.—*S. tenera* And. in DC., Prodr. 16²:288. 1868, non A. Braun (1850); Rydberg in Bull. N.Y. Bot. Gard. 1:269. 1901; Piper in Contr. U.S.N. Herb. 11:216 (Fl. State Wash.). 1906; Ball in Coult. and Nels., New Man. Rocky Mt. Bot. 136. 1909; in Piper and Beattie, Fl. Northwest Coast 117. 1915; Jepson, Fl. Calif. 344. 1909, pro parte.—*S. phlebophylla* Watson in U.S. Geol. Sur. Expl. 40th parallel King's Rep. 5:Bot. 326. 1871, pro parte, non And.—*S. arctica* var. *petraea* Bebb in Watson, Bot. Calif. 2:90. 1879, pro parte, non And.; Ball in Trans. Acad. St. Louis 9:89. 1899, pro parte.—*S. Brownii* var. *petraea* Bebb in Bot. GAZ. 16:107. 1891, pro parte:—*S. Brownii* var. *tenera* Jones, The Willow Fam. 19. 1908.—This species has always been regarded as most closely related to *S. petrophila*, and BALL (1899) mentioned it in the synonymy only as "a narrow-leaved form," while he (1909) says "perhaps only a variety of the preceding" (*S. petrophila*). By a close study of the material before me I have the impression, however, that it possibly might have a more intimate affinity to *S. phlebophylla*. Both BALL and RYDBERG distinguish *S. cascadiensis* from *S. petrophila* only by the smaller size of the leaves and the few-flowered aments, and neither author mentions the fact that the old leaves are more or less persistent, a character not observed by me in *S. petrophila*. The leaves of *S. cascadiensis* are occasionally up to 18 mm. long, and in male specimens, like no. 1074 of Merrill and Wilcox from the Teton Mountains, Wyoming, the catkins bear

more than 20 flowers, and some fruiting aments before me measure up to 2.5:0.9 cm. The systematic position of the species needs further study, however, and it is interesting to note the singular view expressed by ANDERSSON himself as to the relationship of his *S. tenera*: "Memorabilis forma a nostris *S. retusa*, *reticulata*, et *arbuscula* quasi composita. *S. retusae* similis: foliis lingulatis, vix $\frac{3}{4}$ poll. longis, supra medium 2 lin. latis, parallelo-nervosis, integerrimis; *S. reticulatae*: capsulis sessilibus, dense lanatis, pusillis; et *S. arbusculae*: amentis ramulos laterales terminalibus."

The type of *S. cascadiensis* was collected by LYALL in 1860 on the "eastern summits of Cascade Mountains" (f.; K.), and LYALL's specimens were sent out from Kew under the name *S. phlebophylla*; therefore BEBB (in BOT. GAZ. 16:107. 1891) accused ANDERSSON rather unjustly of the use of this name for LYALL's plant. There is no proof that ANDERSSON himself applied his own name *phlebophylla* to this form which he (1868) made the type of *S. tenera*. The writing on the labels of LYALL's specimens is not in ANDERSSON's hand. The specimen collected by WATSON in the Uinta Mountains, Utah (no. 1101, f.; G.), which the collector referred to *S. phlebophylla* because it seemed to match perfectly LYALL's plant, is of peculiar interest; it looks to me more like a pubescent form of *S. Dodgeana* than anything else, but I do not venture at present to pass final judgment upon it.

Sect. III. OVALIFOLIAE Rydberg in Bull. N.Y. Bot. Gard. 1:274. 1899, pro parte, sed sensu emend.—Sect. ARCTICAE Rydbg., l.c. 263, pro parte, non And.; Ball in Coult. and Nels., New Man. Rocky Mt. Bot. 135. 1909, pro parte.—Sect. DIPLODICTYAE Schneider in Sargent, Pl. Wils. 3:136. 1916.—See my first note (BOT. GAZ. 66:117. 1918). To this section belong the following species I have dealt with (l.c.): 13. *S. petrophila* Rydbg., 14. *S. anglorum* Cham., 15. *S. arctica* Pall., 16. *S. ovalifolia* Trvt., 17. *S. stolonifera* Cov., and 18. *S. groenlandica* Ldstr. I wish to add some notes to the following species.

15. *S. ARCTICA* Pall.—Since I wrote the first article I have seen specimens (*Evans*, no. 439, partim; W.) from Kodiak which represent TRAUTVETTER'S *S. diplodictya* mentioned l.c. 123. It is nothing but a mere form with "foliis utrinque concoloribus."

17. *S. STOLONIFERA* Coville.—I mentioned (*l.c.* 137) a new f. *subpilosa* of which as type may be taken B. E. FERNOW's specimen from Glacier Bay, Point Gustavus, June 10, 1899 (Cor.). There are specimens before me from the same bay, Muir Glacier, collected between June 8 and 12, 1899, by *F. V. Coville* and *T. H. Kearney* (no. 621, f.; W.). COVILLE is of the opinion that they, at least partly, represent a hybrid between *S. arctica* and *S. stolonifera*. One of the sheets (no. 373447, W.) looks indeed like such a hybrid; the leaves seem not to possess stomata in the upper epidermis and are partly larger, while the flowering aments measure up to 3:1 cm. The other specimen (of sheet no. 376920), however, can hardly be separated from *S. stolonifera* except by the tomentose ovaries. The leaves have numerous stomata in the upper epidermis, are of the usual size and shape, and the aments are not larger than in typical *stolonifera*. This specimen looks to me more like f. *subpilosa* than like a hybrid. It may be, however, that we have to take all the specimens with more or less pubescent ovaries and fruits for those of hybrid origin, but this does not seem likely to me.

18. *S. ARCTOPHILA* Cock.—Professor T. D. A. COCKERELL kindly informed me that he had published in the last edition of HELLER'S *Cat. N. Am. Pl.* p. 89, 1910, this new name for *S. groenlandica* Lundström but not of Heer (*Fl. Foss. Arct.* 1:101. *pl.* 4. *figs.* 8-10. 1868). I was not aware of this fact, neither had I seen the sheets of this edition of HELLER'S Catalogue. Besides, COCKERELL'S name is not found in the card index published by the Gray Herbarium. I accept this new name, but there is no definite statement in the international rules as to the priority of names of paleontological plants. Owing to this change I have to propose the following new combination, *S. arctophila* var. **lejocarpa** for *S. groenlandica* var. *lejocarpa* Lange (*l.c.* 141).

18a. *S. hudsonensis*, spec. nov.—*S. fullertonensis* × *S. groenlandica* Schneider in *BOT. GAZ.* 66:342. 1918.—Frutex prostratus habitu *S. arctophilae*, ramis pl.m. subterraneis radicanibus ad 5 mm. crassis, ramulis elongatis repentibus glabris ut in *S. arctophila* coloratis, gemmis foliisque ut *l.c.* a me descriptis sed gemmis interdum ad 9 mm. longis et foliis angustioribus acutioribus ad 3.5:1.7 cm. latioribus ad 3.5:2 cm. magnis superne vulgo haud stomatiferis

maturis glabris vel utrinque sparse pilosis; amentis tantum fructiferis visis 2: 1. 3 ad 4: 1 cm. magnis ramulos foliatis ad 4 cm. longos terminantibus; fructibus ad 9 mm. longis pedicello brevissimo vel glandula vulgo distincte brevioribus excluso.

Besides the specimens mentioned (*l.c.* 342), I examined the following: Hudson Bay: 50 miles south of Cape Eskimo, August 5, 1900, *E. A.* and *A. E. Preble* (no. 43, fr., type, 46, st.; *W.*); 25 miles south of Cape Eskimo, August 12, 1900, same coll. (nos. 54, 57, fr.; *W.*).

After having seen the material collected by the PREBLES I think it best to propose a new name for this interesting form, which after all seems to represent a new species closely related to *S. arctophila*, from which it chiefly differs in the shorter pedicels and the more elongated gland. Judging by the flowers alone, one might be inclined to take it for a form of *S. anglorum*, but the leaves are mostly without any trace of stomata in the upper epidermis, and their color and texture are more like in *S. arctophila*. Some specimens cited in my second note may represent hybrids between this species and *S. fullertonensis*. Unfortunately I have not yet seen young female or male flowers, and further investigation is needed to elucidate the real affinity of this form, which seems to be fairly common along the western shores of Hudson Bay from James Bay to Cape Fullerton and also on the islands in the western part of Hudson Strait.

Sect. IV. GLAUCAE *E. Fries*, *Sylog. Pl. Nov.* 2:36. 1828, pro parte.—Sect. ARCTICAE *Rydbg.* in *Bull. l.c.* pro parte; *Ball* in *Coult.* and *Nels, l.c.*, pro parte. For further synonymy see *SCHNEIDER* in *Sargent l.c.* 147. 1916.—In my second paper (*BOT. GAZ.* 66:318. 1918) I have already explained the differences between this section and the ARCTICAE, and there I have also discussed the following species, which are to be referred to this section: 19. *S. fullertonensis* *Schn.*, 20. *S. niphoclada* *Rydbg.*, 21. *S. chlorolepis* *Fern.*, 22. *S. brachycarpa* *Nutt.*, 23. *S. pseudolapponum* *v. Seem.*, 24. *S. desertorum* *Rich.*, 25. *S. glauca* *L.*, 26. *S. cordifolia* *Pursh*, 27. *S. anamesa* *Schn.*, and 28. *S. lingulata* *And.*

I wish to add the following remarks, because I had the opportunity to study some very interesting material of *Herb. W.*, and I

desire to express my gratitude to the curator of the U.S. Nat. Herbarium.

20. *S. NIPHOCLADA* Rydbg.—Having seen a co-type and other material of this species from Herb. W., I wish to correct my statements (*l.c.* 339) as follows: The co-type collected by *Miss E. Taylor* has ripe fruits which measure up to 7 mm. in length and show a distinct pedicel (about 1.3 mm. long) which is distinctly longer than the bifid gland. The male type described by COVILLE (*Funston*, no. 185) has short aments measuring about 10:4–5 mm. and loosely flowered at the base, but there is a specimen collected by *F. C. Schrader* on the John River in northern Alaska, July 10, 1901, of which the female part well agrees with the type of *S. niphoclada*, while the male aments measure up to 22:4 mm., being very slender and loosely flowered. In FUNSTON'S specimens the male flowers are younger, but I hardly believe that they could grow to the size of those of SCHRADER'S plant. Otherwise the flowers are identical, having glabrous filaments and ventral glands of a similar shape. SCHRADER, however, collected another male specimen on Anaktuvuk River (erroneously spelled Ansktoobah River on the label) August 5, 1901, of which the aments are like those of the John River plant, but the filaments are somewhat hairy at base. Otherwise I cannot separate SCHRADER'S plants, and I believe that the pubescence of the filaments which mostly can be taken for a constant character may not be of reliable taxonomic value in this case. We need, of course, a better acquaintance with all the willows of this region to decide the question whether or not the absence or presence of a pubescence on the filaments is a really important character. A fruiting specimen collected by SCHRADER at the same place and date as the last mentioned male one seems to me inseparable from *S. niphoclada*, but the ripe fruits measure up to 8 mm. in length, are almost sessile, and of a more ovoid-conical shape than in the type.

The specimen mentioned (*l.c.* 339) from Fort Churchill, Hudson Bay, collected by *E. A. and A. E. Preble*, is really no. 41, not no. 26 (as given by me and by COVILLE), according to a note by *E. A. Preble* on the sheet (no. 385093) in Herb. W. From the same place the same collectors brought a male specimen (no. 33; W.) which I refer to *S. brachycarpa*, which had been collected there

also by *F. M. Macoun* (*l.c.* 337). PREBLE'S no. 41 may be more closely connected with *S. brachycarpa* than with *S. niphoclada*, but the shape of most of the larger leaves is more elongate-lanceolate in no. 41, where the largest leaves measure up to 4.5:1 cm., while those of MACOUN'S female plant are shorter and broader, and its pubescence is more like in typical *S. brachycarpa*. In no. 41 the young twigs bear a very thick villose pubescence of long soft hairs, which is far more conspicuous than the tomentum of the forms of *S. niphoclada* from the west. After all, I am inclined to believe that no. 41 may represent a form of *S. brachycarpa* comparable to *f. poliophylla* of *S. glauca acutifolia*. We must not forget, however, that we hardly can elucidate those forms without a full understanding of the true *S. desertorum* (see *l.c.* 331).

I have thought it best to treat those forms at a considerable length, because we know so little of the willows of the Northwest Territories, and I wish to give an impulse to their closer investigation in the field by future collectors.

21. *S. CHLOROLEPIS* Fern.—I have described (*l.c.* 339) the var. *antimima*, which looks rather intermediate between the type and *S. brachycarpa*, and which on Mt. Albert seems to be connected by hybrids with the latter. There is a small male specimen in Herb. N. collected by *A. P. Low*, north of Cape Jones on the eastern coast of Hudson Bay, July 16, 1898 (no. 63272 O.). It agrees well with *S. brachycarpa*, and has hairy filaments, but I found some stomata in the upper leaf epidermis. We need much more copious material (male and female) from this locality to judge the form properly.

25. *S. GLAUCA* var. *ACUTIFOLIA* (Hook.) Schn.¹²—Having received, as already stated, very interesting material from Herb. W., I wish to add the following remarks.¹³ There are before me several

¹² I stated (*l.c.* 321) that 2 *S. villosa* had been published before HOOKER described the present form under this name, but there is still a much older *S. villosa* Hoffmann (*Obs. Bot.* 15. 1787) which is not registered in the Kew Index, nor can I find this name mentioned by KOCH, FRIES, WIMMER, ANDERSSON, or v. SEEMEN. It was sent from Sweden by THUNBERG.

¹³ In the note (*l.c.* 321) I made an entirely wrong statement in regard to PURSH'S Canadian collections. Relying on facts given by HARSHBERGER, which he in his turn took from an article in *BOT. GAZ.* 7:142. 1882, I said that PURSH did not collect in Canada. Professor N. L. FERNALD kindly directed my attention to PENHALLOW'S

specimens collected at Great Slave Lake, Mackenzie, which, in my opinion, are most closely related to var. *acutifolia*, but at least some of them seem to represent a very villose form of it, for which I propose the name: *S. GLAUCA* var. *ACUTIFOLIA* f. *poliophylla*,¹⁴ forma nov.—A typo nonnisi differre videtur ramis annotinis densius villosolano lanuginosis etiam vetustioribus tomento lanuginoso pl.m. obtectis, foliis superne pl.m. laxe adpresse sericeo-lanuginosis subtus villo densissimo molli pl.m. adpresso albo vestitis. The type is Great Slave Lake, Fort Rae, July 28, 1901, *E. A.* and *A. E. Preble* (no. 139, fr.; *W.*; folia inferiora elliptica vel oblongo-elliptica, utrinque acuta, superiora magis ovato-elliptica apice acutiora, maxima ad 5:2.2 cm. magna; amenta fructifera pedunculo foliato ad 3 cm. longo excluso ad 5:1.3 cm. magna; fructus e basi rhomboideo ovoideo-conici, ad 9 mm. longi pedicello ad 1.5 mm. longo glandulam subduplo superante excluso).

The following specimens seem to me rather intermediate between f. *poliophylla* and typical var. *acutifolia*: Great Slave Lake: Fort Resolution, July 14, 1901, *E. A.* and *A. E. Preble* (no. 141, fr.; *W.*; forma minus dense quam no. 139 villosa); June 21, 1903, *E. A. Preble* (no. 194, f.; *W.*; eadem forma ut videtur ac praecedens sed juvenilis); Fort Good Hope, on the Mackenzie River, June 23, 1904, *E. A. Preble* (nos. 330, f. et fr. anni praeteriti, 332, f.; *W.*; forma a cl. RYDBERG ad *S. niphocladam* relata foliis floribus juvenilibus; sed folia distincte petiolata et fructus adulti magni). There are two other male specimens of *E. A. PREBLE* from Fort Resolution, June

"Review of Canadian Botany" (Trans. Roy. Soc. Can. III. 4:4. 1897), where he expressly states that "with the exception of his immediate predecessors no botanist had accomplished more than PURSH to make the vegetation of Canada known." When JAMES published the manuscript of PURSH's traveling journal he did "not deal with that part of PURSH's work which was continued into and ended in Canada." "He made extensive collections chiefly through the province of Quebec, but all the material thus accumulated was subsequently destroyed by fire."

Regarding Lord SELKIRK, I have been informed by J. C. NELSON that "Lord Selkirk's Exp." probably refers to THOMAS DUNDAS, Fifth Earl of Selkirk, who (according to JOHNSON'S N. Univ. Cycl. 4:175. 1878) "spent several of the later years of his life in promoting emigration to the Red River of the North, British America." I have not yet been able to consult the tracts which he has published on emigration to those parts of Canada.

¹⁴ Derived from *πολιός*, with white hair.

21, 1903 (nos. 196, 198; W.), which RYDBERG regards as "near *niphoclada* but with much broader and shorter leaves." The young leaves do not differ from those of the female specimen no. 194 previously cited, but the young male aments are very short, not exceeding 1 cm. in length and 0.5 cm. in thickness. Otherwise the flowers agree with those of var. *acutifolia*. If the size of the male aments should prove a reliable character, and if the male plant should belong to the same form as the female no. 194, this form might prove to be a new one more closely related to *S. cordifolia*. See also my remarks under *S. niphoclada* as to the size of male aments.

There is a male specimen collected by *Seton* and *Pringle*, July 19, 1907, near Caribou Island, Great Slave Lake (no. 43 [78305 O.]), which has been named *S. atra* Rydbg. by BALL. At first sight it resembles a great deal PREBLE's nos. 196 and 198 mentioned above, but the leaves, which seem to be almost fully grown, measure only up to 3.6:1.6 cm. The flowers of the one small catkin (2.3:0.9 cm.) I could examine show no trace of a dorsal gland, and the hairy filaments are connected for $\frac{1}{3}$ to $\frac{1}{2}$ of their length. So far this form remains rather doubtful.

26. *S. CORDIFOLIA* Pursh.—The male syntype of *S. labradorica* mentioned (*l.c.* 345) bears the number 21, not 31, of WAGHORNE.

27. *S. ANAMESA* Schn.—In his *Fl. Europ.* 21:157. 1890, GANDOGER has described under *S. glauca* the following 4 new subspecies from Greenland: *S. eskimorum* (type: *Petersen*, Julianehaab); *S. groenlandica*, non Heer, nec Lundström (type: *Rink*, Godthaab); *S. platycarpa* (type: *J. Vahl*, Ikilok), and (*l.c.* 158) *S. Vahlü* (type: *J. Vahl*, Ikilok). Judging by the characters given in the key, all these names refer to a form having "folia anguste lineari-oblonga, 5-12 mm. lata," which are "supra semper canescentia et villosa vel tomentosa" in the last two forms, while they are "supra glabra aut glabrescentia et viridia" in the first two. Not having seen the types, I am unable to say to which species these forms really belong, but I presume they may be referable to what I have called *S. anamesa*. In giving binary names to those forms GANDOGER did the same as ANDERSSON did in several instances in his monograph. I believe, however, that these binomials cannot be regarded as

proper species, and therefore I do not think it advisable to take up one of GANDOGER'S names for *S. anamesa*.

V. SPECIES SECTIONIS INCERTAE. The proper systematic position of the following species is still doubtful to me, and most of them are so little known that it is impossible to even express an idea as to their affinities.

29. *S. CHAMISSONIS* And. in DC., Prodr. 16²:290. 1868; Lundström apud Kjellman in Nordenskiöld, Vega Exp. Arbet. 2:21 (Fanerogfl. St. Lawrence Ön). 1883; Coville in Proc. Wash. Acad. Sci. 3:325. fig. 23. 1901.—*S. myrsinites* Chamisso in Linnaea 6:540. 1831, non L.—The type of this rare but apparently well marked species was collected by CHAMISSO and ESCHSCHOLTZ in 1816 at St. Lawrence Bay; elsewhere it is only known from St. Lawrence Island and Port Clarence in Alaska.¹⁵

30. *S. GLACIALIS* And. in Öfv. K. Vet.-Akad. Förh. 15:131. 1858; in DC., Prodr. 16²:300. 1868; Coville in Proc. Wash. Acad. Sci. 3:329. fig. 24. 1901; Rydberg in Bull. N.Y. Bot. Gard. 1:262. 1899.—*S. Uva-ursi* Seemann, Bot. Voy. Herald 40. 1852, pro parte.—As COVILLE has already stated, "this species is known only from the type specimen collected by Lieutenant *W. J. G. Pullen* in 1849, on the Arctic seacoast between Point Barrow and the Mackenzie River, and from specimens collected at Point Barrow by *John Murdoch* in 1882-3." I have been able to examine a photograph and fragments of the type (*Pullen*, no. 155, f., fr. im.; K), and I agree with ANDERSSON that it is a forma *pusilla* of *S. ovalifolia*. The style is very short but not wanting, and the stigmas are relatively long; the pedicel is also distinct and in fruit about $\frac{1}{3}$ longer than the gland. It resembles the pubescent form of *S. ovalifolia*, which is only somewhat more vigorous, and shows a more distinct (but short) style. ANDERSSON describes the leaves of the type as

¹⁵ After the manuscript of this note had gone to the printer, I found on a sheet with *S. amplifolia* of Herb. Cor. a male specimen of *S. Chamissonis* collected by B.E. on St. Lawrence Island, July 13, 1899, which had been seen by COVILLE but is not enumerated by him in 1901. Had I seen it before I finished my manuscript I would not have included this species in the present key because, judging by the male flowers, it seems to belong to sect. COMMUTATAE, with which I hope to deal later. The male flowers possess only one gland, and the fine and close acute serration of the leaves easily distinguishes this species from all the other willows treated in this paper.

"integerrima," while most of them in the specimen before me show a distinct but fine glandular denticulation in the lower half. Those of the type are entire, with the exception of a few minute teeth at the base of some leaves. They lack stomata in the upper epidermis. If I had seen the type before I finished the manuscript of this article, I would have placed *S. glacialis* next to *S. ovalifolia*, but as long as the male flowers are unknown the true affinity remains unknown.

31. *S. VENUSTA* And. in DC., Prodr. 16²:288. 1868, non Host 1828, from Sitka, of which, according to COVILLE, the description "suggests that the plant may prove to be a form of *Salix reticulata* grown in a shaded situation," can only be judged by an examination of the type material, which I have not yet had the opportunity to see.

32. *S. OBCORDATA* And. in DC., Prodr. 16²:291. 1868, which, like the preceding, came from Sitka, is even more obscure than that, and may prove to be another *S. reticulata* form or a hybrid of it with some other species. ANDERSSON himself placed it without number as *S. obcordata* between *S. ovalifolia* and *S. furcata*, but he says nothing about its relationship to these species, only mentioning its resemblance to *S. venusta* and *S. reticulata* in his more than meager description.

I hope that my notes may prove useful to other students of American willows, and I shall be most thankful to anyone who can correct any mistake I have made or furnish me with good material or information of these or other American willows. There are, of course, quite a number of specimens before me which I have not yet been able to elucidate. Among them are many which I suspect of being of hybrid origin, but I do not intend to deal with the hybrids until I have gained a more thorough understanding of all the American forms of this difficult genus.

ARNOLD ARBORETUM
JAMAICA PLAIN, MASS.